PWD: 171.0, 150.5 and 139.0 ms for each patient). With a cutoff <135.0 ms for a normal PWD, the sensitivity was 78.5%, the specificity was 100%; the positive predictive value was 100% and the negative was 75% for SAPW to identify pts with WPWS and PAF. *Conclusions:* In the current study, pts with WPWS and PAF showed prolonged intra-atrial conduction time when compared with a control group. This may contribute to the development of PAF.

1026 Defibrillation Threshold Testing With Implantable Cardioverter Defibrillators

Wednesday, March 22, 1995, 3:00 p.m.–5:00 p.m.
Ernest N. Morial Convention Center, Hall E
Presentation Hour: 4:00 p.m.–5:00 p.m.

1026-83 Prospective Comparison of the Biphasic Waveform Upper Limit of Vulnerability to the Defibrillation Threshold in Man

Jeanne E. Poole, George L. Dolack, Peter J. Kudenchuk, Charlie Troutman, Jill A. Anderson, Gust H. Bardy. *University of Washington, Seattle, WA*

Background: The upper limit of vulnerability (ULV) is defined as the upper limit of shock strength, above which ventricular fibrillation will not be induced when the shock is delivered during the vulnerable period. ULV is postulated to correlate with the defibrillation threshold (DFT) and, if true, should streamline implantable cardioverter-defibrillator (ICD) surgery and followup.

Methods and Results: We sought to determine whether the biphasic ULV, measured with an easily implemented clinical protocol via the T-shock method available in the 7219D Medtronic ICD using 65% tilt, 120 μF asymmetric pulses, would correlate with the biphasic DFT assessed during follow up electrophysiologic (EP) evaluation of ICD function. Twelve consecutive patients were evaluated. The average age was 67 ± 3.4 years, LV ejection fraction was 0.45 ± 0.04, and 58% had underlying CAD. The index arrhythmia prompting ICD therapy was VF in 83% and VT in 17%. At the time of the follow-up EP study, all patients had VF induced with T-shocks at 310 ms following 3 ventricular paced beats at 400 ms starting at 0.2 Joules and stepping up until the ULV was found as follows: 0.6, 1.0, 2.0, 3.0, 4.0, 5.0, 7.0, 10, 14, and 18 Joules. The DFT was determined using the exact same waveform, polarity and shock steps as was the ULV determination.

Results:

	ULV	DFT
Energy (J):	6.8 ± 4.4	10.2 ± 5.5
Correlation:	r = 0.49, p = 0.11	

Conclusion: We found a poor correlation between the biphasic ULV and the DFT using this clinically feasible followup technique. The ULV appears to underestimate the DFT using this technique for evaluating ICD defibrillation efficacy during follow-up EP evaluation.

1026-84 Impact of the Defibrillating Surface Area of an Additional Superior Vena Cava Electrode on the Unipolar Right Ventricular Coil/Defibrillator Can System

Keith Newby, Lynn Moredock, Judy Rembert, J. Marcus Wharton, Robert Sorrentino, Ruth Ann Greenfield, Kenneth G. Morris, Andrea Natale. *VA Medical Center/Duke University, Durham, NC*

We assessed the hypothesis that the surface area of an additional superior vena cava (SVC) defibrillation electrode may impact on the defibrillation efficacy of a right ventricular (RV) coil/CAN system. In ten dogs we randomly compared the energy requirements for defibrillation (DFT) using the RV/CAN configuration and three triple lead systems employing an additional lead in the SVC with a defibrillating surface area of 90 mm^2, 160 mm^2 and 617 mm^2 respectively. Biphasic shocks with 65% fixed tilt were used for defibrillation. Triplicate defibrillation thresholds were determined with each lead system. With every electrode system the RV coil was used as cathode. Energy (J), peak voltage (V) and impedance at defibrillation threshold are shown below:

	RV/CAN	90 mm^2	160 mm^2	617 mm^2
DFT (J)	8.6 ± 3.3	8.1 ± 2.6	8.2 ± 2.5	4.9 ± 1.9*
Voltage (V)	373 ± 73	365 ± 58	367 ± 65	284 ± 53*
Impedance	74 ± 24	53 ± 13$^+$	48 ± 11$^+$	52 ± 10$^+$

*617 mm^2 vs RV/CAN p < 0.01
$^+$90 mm^2, 160 mm^2, 617 mm^2 vs RV/CAN p < 0.01

These results indicate that the surface area of an additional SVC defibrillating electrode may be critical to improving the energy requirement for defibrillation achieved with a single lead right ventricular coil/defibrillator can system.

1026-85 Enhanced Defibrillation Efficacy with an Active Pectoral Pulse Generator

Michael R. Gold, Andrew H. Foster, Stephen R. Shorofsky. *University of Maryland, Baltimore, MD*

An active pectoral pulse generator can be incorporated in a single coil defibrillation lead system to achieve low defibrillation thresholds (DFT). However, the incremental benefit of an active pulse generator with an integrated lead system has not been evaluated. Accordingly, we performed a prospective trial of a 65 cc pulse generator shell with an Endotak lead in 22 consecutive pts undergoing defibrillator implantation. Energy (E) and leading edge voltage (V) at DFT was measured using a step down protocol to first failure with biphasic waveforms (60:40 tilt). Either lead alone (proximal coil = anode) or lead + shell (proximal coil and shell = anode) were tested with paired testing in random order.

	E (joules)	V (volts)	R (ohms)
Lead alone	13.1 ± 6.7	395 ± 105	49 ± 5
Lead + Shell	8.5 ± 3.1*	319 ± 61*	42 ± 4*

*p < 0.001

A DFT of ≤10J was found in 50% (11/22) of patients with lead alone and 86% (19/22) of patients with lead + shell (p < 0.02).

In conclusion, adding an active pulse generator to an integrated transvenous lead significantly reduced DFTs and system impedance (R). The consistently low defibrillation energy requirements with the use of an active small pectoral shell, makes the development of a defibrillator with reduced size and lower maximal output feasible.

1026-86 The Influence of Sodium Channel Blockade on the Defibrillation Threshold of Biphasic versus Monophasic Defibrillation Waveforms

Michael B. Lenhart, Amir Saffarin, Steven D. Nelson. *The Ohio State University, Columbus, OH*

Several Class I antiarrhythmic drugs are known to increase the defibrillation threshold (DFT) of monophasic shock waveforms delivered by implantable defibrillators (ICD). The influence of sodium channel blockade on biphasic shocks is unknown. The purpose of this study was to determine the effects of lidocaine (LIDO) on the DFT with biphasic versus monophasic shock waveforms in an anesthetized canine model of transvenous defibrillation (n = 10). The DFT was determined by the iterative increment-decrement protocol. Monophasic and biphasic shock DFT's were tested in random order at baseline and during LIDO infusion (8 mg/kg load; 400 microgm/kg/min) and presented below.

	Monophasic DFT (Joules)	Biphasic DFT (Joules)	P Value*
Baseline	16.0 ± 5.6	11.1 ± 2.7	0.006
LIDO	26.4 ± 10.9	16.9 ± 9.0	0.018
P Value**	0.009	0.054	

*p value of monophasic vs biphasic. **p value of baseline vs LIDO

In 2 dogs, the DFT during LIDO was >50 joules with monophasic shock and 27.9 ± 5.6 joules with biphasic shocks. LIDO caused a 13.1 ± 9.8% increase in ventricular refractoriness (p < 0.037) and a 29.8 ± 22.7% increase in QRS duration (p < 0.01), neither of which were predictive of DFT response.

Conclusion: Sodium channel blockade does increase the DFT of biphasic shocks but to a lesser extent than observed with monophasic shock DFT's. These results may have favorable implications for the use of Class I antiarrhythmics in patients with newer generation ICD's.

1026-87 Long-term Changes in Defibrillation Thresholds Using Two Nonthoracotomy Lead Systems and a Biphasic Waveform

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We implanted nonthoracotomy defibrillators in consecutive pts with sustained ventricular arrhythmias. A Ventritex Cadence (V-100C) device using a bipbasic waveform was implanted in all pts. The first 21 systems (Grp I) consisted of a CPI (BT-10) endocardial lead at the RV apex for sensing and pacing, with a CPI (C-10) spring electrode at the SVC/HRA junction and a large CPI patch (L67) implanted subcutaneously in the left axillary region for defibrillation. A single lead defibrillation system (CPI Endotak C, Model #0064) was implanted in 27 pts (Grp II). Mean age was 61 ± 12 years and LVEF was 37 ± 16%. Three successful shocks for sustained VF were required to